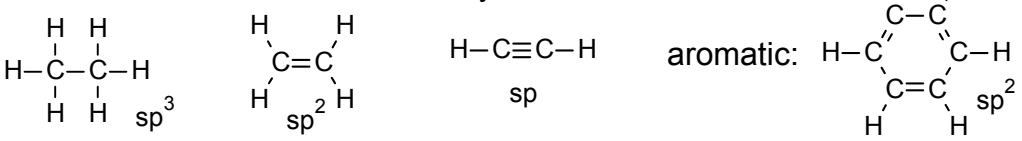
Organic Compounds: *hydrocarbons* and derivatives

just C and H C, H, N, O, X, etc

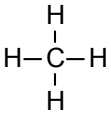
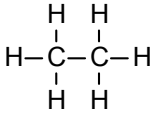
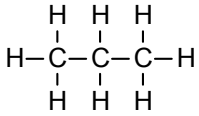
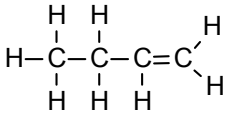
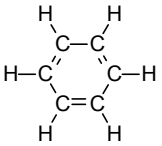
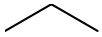
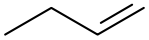
Hydrocarbons: just C and H atoms

alkane: C-C alkene: C=C alkyne: C≡C

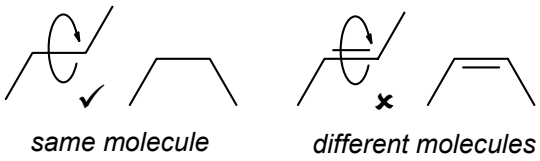


Alkanes are *saturated*: all C atoms are sp^3, with four bonds to four atoms, C_nH_{2n+2}
All other hydrocarbons are *unsaturated*: multiple bonds or rings, fewer than 2n+2 H atoms

Representing Organic Compounds

chemical formula	CH_4	C_2H_6	C_3H_8	C_4H_8	C_6H_6
condensed structural formula	CH_4	CH_3CH_3	$CH_3CH_2CH_3$	$CH_3CH_2CH{=}CH_2$	
structural formula (Lewis)					
line structure					

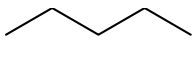
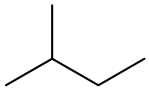
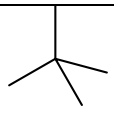
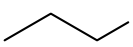
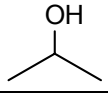
Line structure: each C-C bond is a line, H atoms on C are omitted – *always four bonds to C!*
Note: groups can rotate about a C-C single bond (σ only), but not a C=C double ($\sigma + \pi$)!



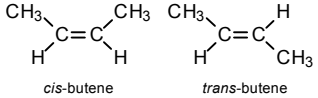
Isomers

Isomers: compounds with the same molecular formula, but different structures

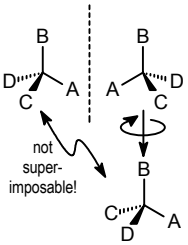
- *Structural Isomers*: isomers that differ in the bonding arrangement and connectivity of atoms. Such isomers can differ in terms of:

carbon backbone (skeletal isomers):	 $CH_3(CH_2)_3CH_3$ pentane	 $CH_3CH(CH_3)CH_2CH_3$ 2-methylbutane	 $C(CH_3)_4$ 2,2-dimethylpropane
functional group position (positional isomers):	 $CH_3(CH_2)_2OH$ 1-propanol		 $CH_3CH(OH)CH_3$ 2-propanol
functional group type (functional isomers):	CH_3CH_2OH ethanol		CH_3OCH_3 dimethylether

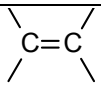
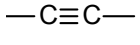
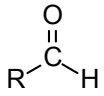
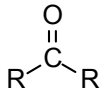
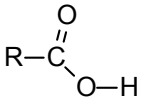
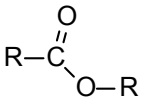
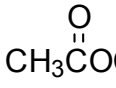
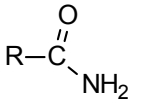
- *Stereoisomers*: isomers that have the same connectivity, but differ in the spatial arrangement of atoms. There are two classes:
  - Geometric isomers: stereoisomers that differ in the relative orientation of substituents e.g. *cis*- and *trans*-alkenes



  - *Enantiomers* (or optical isomers): stereoisomers that are *chiral,* non-superimposable on a mirror image (Eğe Ch6)

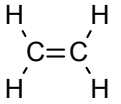
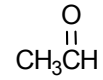
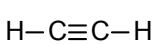
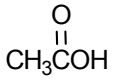
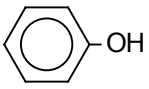
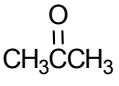
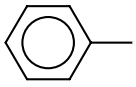
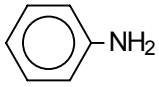
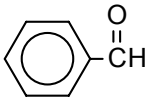
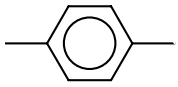
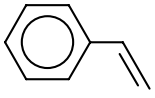


Organic Functional Group List

Functional Group	Compound	Prefix/Suffix	Example	IUPAC Name (Common Name)
R-H	alkane	-ane	CH_3CH_3	ethane
	alkene	-ene	$H_2C{=}CH_2$	ethene (ethylene)
	alkyne	-yne	$HC{\equiv}CH$	ethyne (acetylene)
R-X	haloalkane	halo-	CH_3Cl	chloromethane
R-OH	alcohol	-ol (hydroxy-)	CH_3OH	methanol
$R\text{-}NH_2$	amine	-amine (amino-)	$CH_3CH_2NH_2$	ethylamine aminoethane
R-O-R	ether	ether (alkoxy-)	CH_3OCH_3	dimethyl ether
	aldehyde	-al		ethanal (acetaldeyde)
	ketone	-one		propanone (acetone)
	carboxylic acid	-oic acid		ethanoic acid (acetic acid)
	ester	-oate		methyl ethanoate (methyl acetate)
	amide	-amide		ethanamide (acetamide)

R = alkyl group, an unfunctionalized saturated chain; X = halogen

Organic Common Names

ethylene		formaldehyde		acetaldehyde	
acetylene		formic acid		acetic acid	
benzene		phenol		acetone	
toluene		aniline		benzaldehyde	
xylene		styrene		benzoic acid